BOOK REVIEWS

THE VASCULAR CAMBIUM, ITS DEVELOPMENT AND ACTIVITY by W. R. Philipson, J. M. Ward, and B. G. Butterfield, with pp. 168 text + figures. London: Chapman & Hall Ltd., New York: Barnes & Noble, 1971. £3.

The vascular cambium has received much attention from investigators, especially during the last three decades, and the literature on it is scattered. This work is, I believe, the first comprehensive account, at least in the English botanical literature, on the vascular cambium. In the book the most important of the accumulated literature on the development, structure, and activities of the cambium is reviewed and discussed, from the time of De Bary, Hartig, and Sanio, to the present.

The authors have successfully steered clear of lengthy discussions on the structure of the wood and bast tissues derived from the cambium, discussing only what is essential in understanding the relationships between the activities within the cambium and the resultant derivative tissues. They also indicate where gaps occur in our knowledge.

The first two chapters deal with the nature, development, and structure, including the ultrastructure, of the cambium, and the manner of cell division and cell elongation of its initials and early derivatives. Next, the origin and development of the vascular rays in conifers and dicotyledons are described, and in what ways the rays of the structurally primitive dicotyledons differ from the more specialised conditions. In the fourth chapter variations in the size of the fusiform cambial initials are described.

Separate chapters are given to storeyed cambium, to anomalous cambia which are responsible for the production of the various types of anomalous secondary thickening in dicotyledons, including work done in South Africa on it, and to the cambium of arborescent monocotyledons. Another chapter deals with cambium modifications occurring in different parts of the plant, and a chapter is given to the reactions of the cambium to gravity, which lead to the formation of reaction wood in inclined and horizontal branches.

Lastly, the factors, both inside and outside the plant, influencing cambial activity are discussed, as well as experiments conducted to find out the role of the endogenous growth hormones in activating the cambium.

A good balance has been maintained between text and illustrations. About half of the almost 30 micrographs are original and most are of satisfactory quality. Numerous line drawings and diagrams, and several graphs, illustrate certain points in the text clearly.

An extensive bibliography is given with each chapter, showing that the authors have consulted most of the important literature on the subject, up to and including 1968.

A combined author, subject, and plant name index is given, running to more than twelve pages.

Printers' or authors' errors are few (Solerader p. 82, 83, diagrammatically for dramatically? p. 87). The meaning of some sentences is unfortunately not quite clear (e.g. farther from the tree p. 91; sectors with narrowest rings p. 91; successive quarters of the annual rings p. 127). The use of the term *procambial strands* cannot be approved of for the young, still undifferentiated, secondary vascular strands formed by the cambium in arborescent monocotyledons.

On the whole, however, the book is well written. It is mainly for the plant anatomist and wood anatomist, as well as for the postgraduate student, and parts of it are also suitable for the senior undergraduate student to use as extra reading matter.

M. P. DE VOS

THE ROLE OF NITROGEN IN GRASSLAND PRODUCTIVITY by D. C. Whitehead with pp. viii + 202, 15 tables and 22 line figures. Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England, 1970. £2,25.

It is generally considered that in many countries there is a greater potential for increased agricultural production from grassland than from arable land provided the grassland is properly managed. Of the various factors which determine the productivity of a sward, nitrogen plays a key role. Although numerous investigations have been conducted throughout the world on various aspects of the nitrogen economy of grasslands, this book is the first attempt to provide a comprehensive review of the soil, plant, animal and management aspects of the nitrogen economy of grasslands.

The 160 pages of the text are subdivided into no fewer than 36 chapters which are grouped into three parts, viz: "Nitrogen transformations in grassland ecosystems", "The yield response of grass swards to fertilizer nitrogen" and "Effects of fertilizer nitrogen on the composition and quality of herbage."

The style of the book is that of a highly condensed review rather than a student textbook. With its 516 references and comprehensive index, it will be valued most as a reference source to the wide field it attempts to cover and should find a place on the shelves of all pasture scientists, especially those active in research. Inasmuch as most of the work which has been reviewed was carried out in regions that have a climate and vegetation which is quite different from that of South Africa, the book will probably be less useful to local readers than to those living in the more humid temperate regions of the world although many of the basic principles are universally applicable.

N. GROBBELAAR

EVOLUTIONARY ECOLOGY. ed. by Herbert P. Riley, with pp. xii + 113. Belmont, California: Dickenson Publishing Company Inc., 1970.

This compact book has been prepared to reflect a number of recent trends in evolutionary ecology, or, as it is known by some, genecology. A collection of studies of evolutionary variation is presented, seen in the setting of special environments, population structures and breeding patterns. These are important general topics, touching on a wide range of fields in the biological sciences.

The book includes extracts, and some full texts, of twenty research papers published in the years 1963–1968 by a number of authorities. All the papers chosen are in English and due acknowledgement is made for those that could not be included through limitations of space. The choice was based on showing current trends in work with as wide a variety of organisms and environments as possible. The papers are given in four chapters, entitled "Nature of Variation", "Natural Selection", "Ecological Adaptation" and "Ecological Evolution".

There are brief introductions to each chapter. These are suited more to the specialist reader. The student may need more precise guidance on the trends shown in the range of advanced material that is presented. There are few illustrations, those of the original authors being reduced to a minimum. No new illustrations have been added. With the commendable range of plant and animal problems that are discussed, reference texts should certainly be close at hand when using this book. Full lists of the author's references are given with each paper and extract. Where extracts have been made, the emphasis has been to give the author's discussion and conclusions in full, generally with the introduction and summary.

This editorial policy will certainly be successful in drawing the attention of the specialist and the senior student at South African Universities to the chief material in some key papers. For the student there is some excellent material for seminars, essays and discussions. For the specialist there will be the stimulus for carrying out similar studies in this fundamental field in a South African setting. Indeed, one notes that three of the studies are based partly or wholly on South African plants and animals.

A. V. HALL

INTRODUCTION TO THE FINE STRUCTURE OF PLANT CELLS by M. C. Ledbetter and K. R. Porter, with pp. 188. Berlin, Heidelberg, New York: Springer-Verlag, 1970. $15.40.

This atlas comprises more than 40 large format, full-page (ca. 28 × 20 cm), and numerous half-page micrographs illustrating the ultrastructure of cell types of higher plants, as studied with the electron microscope.

Meticulous care has been given to the preparation of this work. The micrographs, most of which have not been published before, are of an excellent quality and clarity. They were made mainly in the Laboratory for Cell Biology at Harvard University and also at Brookhaven National Laboratory where the authors work. No one is better suited to publish a work of this kind than these two authors who have published numerous articles on cell fine structure, the senior author during more than two decades, and who, in America at least if not in the rest of the world, stand in the forefront of research on the subject.

In the preface the authors state that they have brought together electron micrographs representing a number of cell types from higher plants. This is an understatement, as almost all types of tissues are included. Micrographs are shown not only of the commonly occurring tissues e.g. parenchyma, collenchyma, sclerenchyma, the epidermis and stomata, endodermis, the different kinds of vascular elements, and the vascular cambium, but also of the more unusual cell types with special inclusions, such as a laticifer, a tannin containing cell, an idioblast with developing raphides (are raphidosomes a new discovery?) and secretory cells of a nectary. In fact, the only tissue not illustrated, that I can think of, is periderm.

Special attention is given to the fine structure of cytoplasmic organelles and cell membranes in interphasic and dividing cells, such as chloroplasts, chromoplasts, mitochondria, dictyosomes, microtubules, the endoplasmic reticulum, etc., and to the changes occurring in the cytoplasts of dividing cells.

Micrographs of more than passing interest are three illustrating the differences (and similarities) obtained with different fixing agents. Another, illustrating a freeze-etch image of a cell, is accompanied by a description of the freeze-etch technique which will be intelligible to the layman.

Of interest to the embryologist are the micrographs showing sections through reproductive tissues in higher plants. Parts of the anther in different stages of development are given, e.g. sporogenous tissue, pollen-mother-cells, the spore tetrad, tapetum, and pollen grain, as well as the pollen tube and young female archesporium.

Each plate is accompanied by a description drawing attention to the salient points shown in the micrograph, and also serving to introduce the student, who may not be well versed in cell morphology, to the basic facts concerning cell structure. Some conjectures are made (e.g. sporopollenin in the tracheid wall) and contentious matters raised with regard to the interpretation of certain of the structures seen in the micrographs, and the possible functions of certain of the cell organelles. The authors mention in the preface that this is done intentionally, to provoke thought on the part of the student; they also indicate where our present knowledge is still limited.

As this work is basically an atlas, the descriptions of the micrographs have generally been kept short and to the point. A list of selected references is, however, provided with each description, which will be of inestimable value to the senior student for further study.

Some minor points of criticism can be raised. To my mind it is somewhat of a pity that the more generally accepted terms (e.g. sexine and bacules) for the different layers of the sporoderm of the pollen grain, as advocated by Erdtmann in *The Handbook of Palynology* (1969), have not been used. Also, the description of the very young anther precursor— "a central mass . . . of sporogenous tissue covered by an epidermis"—is misleading.

An alphabetical subject index is lacking, but the table of contents is detailed enough to make up for this omission.

This atlas will be useful and of interest to the undergraduate and postgraduate student alike, as well as to the professional botanist and research worker. It gives the student an excellent insight into the work that has been done on plant cell ultrastructure during the last two or three decades, and also into the problems that have not yet been elucidated.

The authors, the laboratories in which the micrographs were made, as well as the publishers, can be congratulated with this admirable work.

M. P. de Vos